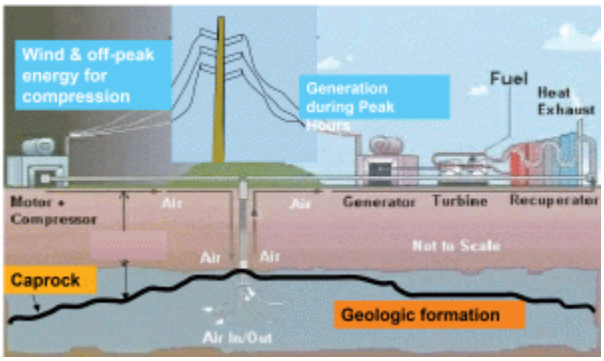
Scrapped Iowa project leaves energy storage lessons



(Image via Sandia National Laboratory)

The plan was to take electricity generated by Iowa wind farms at night and use it to compress air into a deep, underground aquifer northwest of Des Moines.

During the daytime, when electricity is in greater demand, the airflow could reverse, spinning turbines with a blast of air as the subterranean container depressurized.

Investors pulled the plug on the Iowa Stored Energy Park project this summer. After years of study they concluded Iowa's sandstone aquifers aren't suitable for compressed-air energy storage.

However, the project leaves behind some promising economic findings and other lessons for other energy storage projects.

On Friday, the project's lead consultant, Bob Schulte, will participate in a U.S. Department of Energy webinar to debrief the industry on what they learned.

"A big part of the story is that the economics look good," says Schulte. "This dog can hunt."

Going underground

The history of compressed-air energy storage is brief. A 290-megawatt facility has been in operation in Germany since the late 1970s. An Alabama electric co-op brought a 110-megawatt facility online in 1991. That's it. Only two exist in the world, and none have been built in the last two decades.

Interest in compressed-air energy storage is resurfacing, and not just in Iowa. Projects have been proposed in Nebraska, Texas, Utah, Ohio, New York and California.

Haresh Kamath, energy storage program manager for the Electric Power Research Institute, says the industry is looking to energy storage as a way to improve the grid's

reliability and better manage intermittent renewables like wind and solar. Where the right geology exists, compressed air may be a simple and economical solution.

“All you need here is a big hole in the ground and a lot of air and you’re all set,” Kamath says.

The Iowa Association of Municipal Utilities started to explore compressed-air energy storage in 2003. Its members face the same problem all wind-power purchasers do: wind tends to blow the most at night, when electricity demand is usually at its lowest. Being able to store that power for the daytime would help make wind more economical.

The energy park project, which would have generated up to 270 megawatts, received $3.2 million in funding from the Iowa Power Fund and $4.7 million from the U.S. Department of Energy.

The team started with more than 100 potential sites across the state. They used existing geologic surveys to lower it down to just five. They ran seismic tests on those sites, and then took drilling samples last year at the most promising one, just outside of Dallas Center, a Des Moines suburb.

Compressed air would have been stored 3,000 feet below ground in an upside-down-bowl-shaped aquifer made of porous sandstone. Ultimately, the group concluded that air didn’t flow fast enough through the aquifer for it to be effective as a compressed-air energy storage site.

Gas industry there first

Despite the lack of completed projects, the concepts and technology behind compressed-air energy storage are far from exotic. The natural gas industry has used underground storage for decades. In fact, the gas industry has already claimed and put to use many of the prime locations.

“Iowa thought there was a lot there, and there really wasn’t,” says Georgianne Huff, a project manager in Sandia National Laboratories’ energy storage group. “There are some geologic formations there, but they’re being used by the natural gas industry.”

Still, several potential sites remain, says Huff. Salt domes along the Gulf Coast, for example. Xcel Energy is looking into using depleted natural gas wells for compressed-air energy storage. Aquifers may work, although it’s unknown whether they could sustain constant, daily pressure changes, says Huff.

The electricity industry has been slow to explore compressed-air energy storage for several reasons, says Huff. One factor is likely a cultural and expertise gap.

"They're electrical engineers and mechanical engineers. They're not geologists, and geologists aren't electrical engineers, and they don't speak the same language," says Huff.

Compressed air isn't necessarily better or worse than pumped-hydro energy storage, says Huff, but each requires very specific sites, and so one may work where the other will not.

A new compressed-air energy storage facility in Ohio was slated to be completed about a decade ago, but its funding fell apart in the wake of the Enron scandal, says Huff. In November 2009, Akron utility FirstEnergy bought the rights and plans to revive the development, which would be in an abandoned limestone mine in Norton, Ohio. (FirstEnergy didn't return a phone call.)

Also, the Nebraska Public Power District announced last fall that it plans to buy the rights to store compressed air in sandstone formations in the western part of that state.

The Energy Department will seek to help inform storage developers with its Lessons From Iowa webinar and report. Schulte, of the Iowa Stored Energy Park, says the presentation will be a "cookbook on how to do a bulk storage project."

The Lessons From Iowa webinar will take place Friday, January 20, at noon Central. More information is at energy.gov.

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